3.2 FIELD STANDARDS AND COUNTERPOISE WEIGHTS

a. General

Field standards and counterpoise weights shall include, but not be limited to, on-site block weights, portable block weights, and test weight kits; and shall conform to the specifications and tolerances established by the National Institute of Standards and Technology (NIST) Handbook 105-1 (1990 edition), for field standard weights.

b. Class F Tolerances for Field Standard Weights

The tolerances are one part in 10,000 for weights 1 kg (2 lb) and larger, 70 mg for weights between 1 kg and 300 g, and one part in 5,000 for weights 300 g down to and including 10 g. Tolerances for weights below 10 g are determined from the equation:

$$T(W) \text{ in mg} = 0.9\ W^{0.31795}$$

Where W is the nominal value in grams. Tolerances in the tables on page 3-18 have been rounded to two significant digits.

For weight denominations smaller than 1 kg (2 lb), intermediate between those values listed in the tables, the tolerance for the lower denomination shall be applied. The prescribed tolerances shall be applied equally to errors in excess and errors in deficiency.

c. Field Standard Values

(1) Railway Test Cars Under FGIS Jurisdiction

The stenciled weight of a test car or monitor car shall be in 1,000-pound intervals.

(2) Vehicle and Hopper Scales

Field standard weights for vehicle and hopper scales shall be sealed to a 50-pound interval.

(3) Numbering Field Standards

Elevator field standards shall be numbered so they may be properly identified.

Class F Weight Tolerance Chart

Class F Tolerances for Field Standard Weights

Avoirdupois					Metric	
Denomination	Tolerance		Denomination	Tolerance	Denomination	Tolerance
10 000 lb	1.0 lb	450 g	8 oz	45 mg	500 kg	50 g
5 000	0.50	230	4	23	300	30
3 000	0.30	140	2	11	200	20
2 500	0.25	110	1	5.4	100	10
2 000	0.20	91	0.5 (½)	2.8	50	5.0
1 000	0.10	45	0.3	1.8	30	3.0
500	0.050	23	0.25 (¼)	1.7	20	2.0
100	0.010	4.5	0.2	1.6	10	1.0
50	0.0050	2.3	0.125 (⅛)	1.3	5	.50
30	0.0030	1.4	0.1	1.3	3	.30
25	0.0025	1.1	0.0625 (1/16)	1.1	2	.20
20	0.0020	0.91	0.05	1.0	1	.10
10	0.0010	0.45	0.03125 (1/32)	0.87	500 g	70 mg
5	500 μlb	230 mg	0.03	0.85	300	60
3	300	140	0.02	0.75	200	40
2	200	91	0.015625 (1/64)	0.69	100	20
1	150	70	0.01	0.60	50	10
0.5	100	45			30	6.0
0.3	60	27			20	4.0
0.2	40	18			10	2.0
0.1	20	9.1			5	1.5
0.05	10	4.5			3	1.3
0.03	6.0	2.7			2	1.1
0.02	4.0	1.8			1	0.90
0.01	3.2	1.5			500 mg	0.72
0.005	2.6	1.2			300	0.61
0.003	2.2	0.99			200	0.54
0.002	1.9	0.87			100	0.43
0.001	1.5	0.70			50	0.35
					30	0.30
					20	0.26
					10	0.21
					5	0.17
					3	0.14
					2	0.12
					1	0.10

d. Care of Standards

(1) Covers

Standards exposed to the elements shall be kept covered or stored in a reasonably dry environment when not in use. Covers shall be required for weights that in the opinion of the Service are not being kept clean.

(2) Damage or Abuse

Any evidence of damage or abuse to the standard itself or the sealing cavity shall necessitate reverification of the standard.

NOTE: The sealing cavity shall be clearly marked with the date of reverification. Standards shall be repainted after "as found" data has been determined and before adjustments are made.

(3) Contact with Floors

Provisions shall be made so that field standard weights shall not have direct contact with a solid floor (i.e., by use of steel grating).

e. Reverification Frequency

(1) Large Field Standards

When reverifying large field standards, the approved laboratory shall clearly and conspicuously stamp the seal of the adjustment cavity with the year reverified and, upon request, provide appropriate documentation to the Service. Field standards approved by State Weights and Measures authorities must have an accompanying Report of Test (ROT) on file in order to be recognized as official standards.

(2) Basket Weights

Open baskets shall be sealed to a 50-pound multiple and shall be tolerance tested and treated as a normal standard.

Closed baskets shall be sealed as an integral part of composite summation. The closed basket shall be designed in such a manner to incorporate a fitted cover plate which shall be locked during calibration. A pre-numbered seal shall be included as part of the weight value. Once tested, the basket shall be sealed with the pre-numbered seal and the number shall be recorded in the Scale Record Log (FGIS-963).

(3) On-site Block Weights and Closed Basket Weights Without Casters

These weights shall be reverified every 3 years. This category shall include large one-piece standards and sealed baskets containing weights.

(4) Counterpoise Weights, Field Standard Weights up to and Including 50 Pounds, and Sealed Baskets with Casters

These weights shall be reverified each 3 years.

(5) Portable Block Weights

These weights shall be reverified at least every 3 years. Portable block weights shall be construed to mean one piece standards utilized by approved testing agencies. Documentation of the reverification date shall be supplied to FGIS upon request.

(6) Railway Track Scale Test Cars

Test cars utilized in the testing of railroad track scales under the jurisdiction of FGIS shall be reverified at least annually. Documentation indicating date and location of last reverification shall be supplied to FGIS upon request.

(7) Chains, Hangers, and Baskets

Any chains or hangers utilized for suspending test weights, when balanced as part of the zero-load of the scale, need not be reverified.

(8) Fabricated Field Standards

In cooperation with the National Institute of Standards and Technology FGIS has determined that fabricated (filled shell) and laminated weight designs are no longer acceptable. These types of weights have not shown the necessary stability for maintaining tolerances during test cycles.

(a) No new fabricated weight shall be placed into service.

(b) A fabricated weight in service, that has maintained Class F tolerances between verification tests, shall continue to be acceptable. These weights shall be tested every 3 years.

(c) Fabricated weights found to be out of tolerance at the time of a verification test shall be adjusted as close as possible to zero error, and allowed to remain in service for 1 year. During the 1 year period, the owner must arrange to replace the weight, since it will be condemned and removed from service on the anniversary date of the test.

(d) Notification of official rejection of test weights will be made by a letter from the Director of the FGIS, Field Management Division to the manager of the elevator after a thorough review of the data.

(9) FGIS-Owned Field Standard Weights and Counterbalance Weights

These weights shall be reverified each 3 years. Official agencies are required to have their standard weights and counterbalance weights reverified in a similar manner.

Note: Reverification should be performed by NIST certified State Weights and Measures Metrology Laboratories, when practicable. If not practicable, contact the FGIS, Weighing and Equipment Branch, to make other arrangements.

Reverification Schedule for FGIS-Owned
Field Standard Weights

Type	Reverification Frequency	Tolerance
1. Field Standard Weights		
a. Commodity weights (1, 2, 5, 10, 25, and 50 pounds)	3 years	NIST Class F
b. Metric weight kits:		
1) Class P Brass [1]	3 years	NIST Class P
2). All other kits	3 years	NIST Class F
c. Pounds per bushel weights	3 years	
2. Laboratory Counterbalance Weights[2]	3 years	NIST Class F

f. Test Weight Reverification (TWR)

(1) General

The FGIS TWR program is a National Institute of Standards and Technology, Office of Weights and Measures recognized program, which is accepted by most states having official grain scales. The TWR service is provided by FGIS to facilities that do not have access to State Weights and Measures metrology services. The service entails a procedure for checking facility test weights at the facility, adjusting the weights, and providing a ROT.

[1]Used only for testing weighing devices. FGIS discourages the purchase of weights other than Class F. Other classes may be used if a State metrology laboratory has certified them. The same applies to old NBS circular ***Class S-1 weights***. In addition, Class S-1 weights ***shall be reverified annually***. Class S-1 weights have accuracy tolerances so small that they must be handled by wooden or ivory forceps, chamois skin, or special lifters so grease cannot be left on, or damage the weights.

[2]Counterbalance weights are those used with a weighing device to make weight determination; e.g. Shadograph weights, stainless steel metric weights, and Toledo scale weights.

(2) TWR Equipment Setup

A location for TWR must be selected such that reverification of the test weights can be performed with minimal effects from environment and elevator operations. The following conditions are necessary for accurate use of the TWR equipment.

(a) The test station should be located in a place convenient for moving the weights to and from the scales.

(b) Walk-by traffic should be minimized.

(c) There should be no heating sources or drafts in the immediate area.

(d) There should be no direct sunlight on the TWR equipment.

(e) The facility must provide one or more handling carts and labor to move the weights from the scale to the test station and back.

(f) The reverification loadcells are designed to be suspended under a structural steel "I" beam similar to the drawing shown in Attachment 5.

1) The elevator must provide a structural steel bridge anchored in such a manner to support loads at least four times as great as the largest test weight to be applied.

2) The structural steel bridge "I" beam must measure 10 inches deep by 6 inches wide flange or conform to the drawing if the bridge is constructed by bolting two 10 inch channel beams back-to-back.

(g) The supporting steel shall be level and a minimum of 10 feet in length if free standing or set perpendicular to a wall; or a minimum of 15 feet if set diagonally on a corner angle.

1) A minimum clearance of 48 inches is required between the closest wall and center line of the steel bridge.

2) The height of the structural steel bridge, as measured from the bottom flange to the concrete floor, should be 96 inches or more.

(h) The basket, channels, and 50-pound weights must have been calibrated by an approved weights and measures laboratory. The correction weights need a ROT or calibration report. At the test station, the summation is adjusted using the correction weights to bring it to the required nominal value.

(3) TWR Procedure - Electronic Mass Comparator

(a) The comparator is composed of three main parts: the lifting linkage, measuring instrument, and load cell. The lifting linkage has a hydraulic cylinder with clevis eye, rod end bearings, and clevis. The assembly of the linkage, connectors, and hooks must be carefully examined. Do not use any equipment that shows signs of fatigue or wear. The linkage must be assembled as shown in Attachment 6. No chains may be used.

(b) Select the 2K load cell for weights from 500 pounds to 2,000 pounds. Use the 5K load cell for weights over 2,000 pounds up to 5,000 pounds.

(c) Instrument Set-Up

The electronic instrument is not explosion-proof; however, it is suitable for use in most areas of the grain elevator, if facility management approval is obtained. It must be set up according to manufacturer's instructions.

1) Warm up the instrument for at least 1 hour. Keep the dust-tight case closed to stabilize the temperature.

2) Select auto calibration OFF, 6-wire load cell connection, filter 4, tare OFF.

3) Program the instrument as shown in Attachment 7. This will ensure that the division size is appropriate and that the instrument is spanned properly.

(d) Check sensitivity

First exercise the cell by lifting and lowering a weight until the readings appear stable. The instrument reading should change an amount equal to the sensitivity weight added to the weight. The sensitivity weight should be equal to twice the allowable tolerance for the test weight being reverified. Example: For a 2,500-pound test weight, use a 0.5 pound sensitivity weight.

(e) Load the standard with correction weights. Raise it gently with the hydraulic cylinder. During the test procedures do not shock the load cell or treat it roughly since this is a possible source of shift. The instrument indication should be completely stable after approximately 45 seconds. Record the indication; note that it will not indicate the correct weight of the standard because this is not a direct reading scale -- it is used to compare differences in mass.

(f) Lower the standard to a cart with casters that is used for temporary storage during the test cycle.

(g) Load the first house weight. Raise it gently with the hydraulic cylinder. The instrument indication should be completely stable after approximately 45 seconds. Record the indication. Lower the weight.

(h) Repeat items (e) and (f). This provides the third instrument reading necessary to determine a value for the house weight. Three readings are needed to compensate for the slow drift that is normal for the instrument. The standard value must not change by an amount greater than the tolerance applied for the size weight being tested. Normally, the comparator will perform much more consistently than this limit.

(i) Calculate the difference between the standard and the house weight. Use the modified substitution equation:

$$d = O_2 - \frac{(O_1 + O_3)}{2}$$

Where d = difference between the weights in pounds
O_1 = First reading for the Standard
O_2 = Reading for the House weight
O_3 = Last reading for the Standard

Example: 3,000-pound weight

Observation O_1 Standard 2998.90
Observation O_2 House Weight 2999.05
Observation O_3 Standard 2999.00

Observation O_1 = 2998.90
Plus Observation O_3 = 2999.00 = 5997.90

divided by 2 = 2998.95

Observation O_2 House Weight 2999.05 - 2998.95 = 0.10 lb
In Tolerance

(j) Because of the uncertainties of the comparator, we must have the weight difference ≤ ½ tolerance. Adjust the weight, if needed. Refer to item (4) below for adjustment procedures. After adjustment the series of three observations must be repeated in its entirety.

NOTE: Obtain permission from the elevator manager to adjust the weight. This first elevator house weight will be used as a control standard to be compared periodically against the summation standard.

(k) If the operator feels that the data indicates a system change, the control standard may be used to verify the change. The control standard is the first house weight that was tested and adjusted, if necessary, and placed near the comparator to be used to ensure repeatability of the system.

(l) Update the lead seals of all weights approved by flattening the seal, as necessary, with a drift and stamping "FGIS-MO/YR." The same technique applies to adjusted weights where new seals are made. Record this final action.

(4) Adjusting Procedure

(a) Carefully remove the lead seal with a punch. If it is damaged, cut a new one from a sheet of lead and discard the damaged one before proceeding.

(b) Remove the seal backing plate and plug. Normally this requires a ⅝-inch key steel.

(c) Remove adjusting material if the weight is too heavy. Use grabbers or a spoon-type scoop and remove larger pieces first. Be sure you remove slightly more than enough material indicated by the instrument. Place the pieces and shot in a light paper cup.

(d) Reload the house weight on the comparator. Put the cup, plug, backing plate, and good lead seal, on top of the weight.

(e) Adjust to achieve zero error condition by adding or removing lead shot.

(f) Test the weight after adjustment by performing the series of three observations.

(g) Replace all parts of the adjustment cavity; use a punch to flatten the lead seal. Imprint "FGIS-MO/YR" on the seal.

(5) Documentation of Results

TWR readings, the amounts of error weights, the amount of correction weights, and amount of sensitivity weights applied to the standard or the weight being reverified must be recorded.

(a) Cover and Information Sheet

This sheet is used to document the following historical information. (See Attachment 8).

1) Name of manager or superintendent

2) Name of company (elevator name) and date

3) Complete mailing address, including zip code

4) Code numbers for each group of weights

5) Size

6) Type of weights - cast, fabricated, other

7) Name of test weight manufacturer

8) Last reverification date (from weight seal)

9) Dimensions, size, and location of adjusting cavity should be indicated on the drawings.

(b) Test Weight Reverification Data and Calibration Report

This report is used as a worksheet for recording observations and computing error while performing the reverification (See Attachment 9). The following information is shown on the report.

1) Elevator: Elevator name

2) Location: City and state

3) Temperature: Approximate temperature near TWR equipment.

4) Correction: Enter the correction weight and color code for the summation standard being used.

5) Sheet No.: Maintain numbering sequence

6) Date(s): Date(s)

7) Observer: TWR personnel name

8) Comparator Number: TWR equipment designation

9) Description of Load: Enter the designation of the load, FGIS weight code number, or FGIS 50-pound standards and the amount of any correction weights. Use the word "ditto" to indicate the same description of load as previously indicated. The initials S.W. should be used to indicate when a sensitivity weight is applied. The amount of the weight must follow the S.W.

10) Observations: Enter the display value for the standard. If a control standard reading is being taken, write the words, CONTROL STD.

11) Computations: The results of the sensitivity check, the amount of error found in an elevator weight and any other notations pertinent to the reverification procedure are placed in this column.

12) Remarks: Note whether a house weight was left with error and in tolerance or whether the weight was adjusted. Any other pertinent remarks may be placed in this column.

(c) TWR Summary Report

This report is used to summarize the results of all the weights at a particular elevator. The following information is used to update the computer records at headquarters (See Attachment 10).

1) Elevator: Elevator name

2) Location: City and state

3) Date(s): Date(s) of TWR

4) FGIS Weight Code Number: The assigned code number for each weight tested.

5) Type of Weight: Indicate whether the weight is cast (CA) or fabricated (FAB).

6) Weight Value: The nominal weight of the house weight in pounds.

7) Pounds of Error: Indicate the amount that the house weight is light (-) or heavy (+).

8) Adjustment (N/A = Not Adjusted): Indicate the error in the weight after adjustment.

9) House Weight Code Number

10) Scale Number

g. Calibration of Test Car Test Weights

(1) Purpose and Background

(a) Each of FGIS' three railway track scale test cars (FGWX 100,000, FGWX 200,000, and FGWX 300,000) are equipped with either nine or ten, 10,000-pound block weights and one 10,000-pound dolly. These are used for railway scale testing, calibration of master scales, and field calibration of railway scale test cars.

(b) FGIS maintains standard weights traceable to NIST at the Master Scale Depot, Chicago, Illinois. They are used with a 5-ton comparator to calibrate the test car weights and dollies.

(c) Test weights must be recalibrated once a year.

(2) Preliminary Setup

(a) Inspect the weights. The weights and dolly must be clean and free of corrosion or peeling paint. If necessary, they must be stripped and repainted. Use a zinc chromate primer and an aluminum spray finish.

(b) Check the dolly. Make any needed repairs. Fill the oil reservoir to the line on the visual gage.

(c) Visually check the 5-ton comparator. The platform and other moving parts must not bind. Examine bolts, connectors, chains and hooks. Do not use equipment that shows signs of wear or fatigue.

(d) Place the weight cradle on the scale platform. Put rubber pads on the ends to cushion the weights.

(e) Position the weights. Place the standard and the weight to be calibrated at either side of the comparator. The overhead crane should not need to be positioned; only the traversing trolley needs to be moved during the calibration.

(f) Check the most recent report of calibration for the standards. Ensure that the corrections for apparent mass are used in your calculations.

(g) Check the tare weights (trim). A recent ROT to Class F tolerances is required.

(h) Prepare data sheets. Fill in the heading of the data sheet with the date, operator, standard I.D., check standard I.D., and test weight identification.

(3) Procedure (Double Substitution 3-1 Weighing Design)

(a) For safety, two people must be present when moving or testing weights at the Master Scale Depot.

(b) Place counterpoise weights equal to 10,000 pounds on the tip end of the beam.

(c) Place the standard 10,000 pound-weight (S) on the platform. Avoid shock loading.

1) Add 2.0 pounds of tare, release the beam, and balance the scale.

2) Read the turning points of the beam. The sum should be near to 20 divisions. If necessary, adjust the tare until the proper sum is obtained.

3) Arrest the beam. Remove the standard and tare.

(d) Place the test weight (W1) on the platform.

1) Release the beam. Add the required tare. Observe the turning points; add or remove tare to keep the turning points on scale.

2) Read the turning points and record them.

(e) Add a 0.1-pound sensitivity weight to W1 (and tare). Read and record the turning points. Arrest the beam.

(f) Remove the W1 weight, tare, and sensitivity weight.

(g) Place the S weight on the platform.

1) Add the same tare as in step (3) (c) 2) Normally, this will keep the beam on scale, but adjust the tare, if necessary.

2) Add a 0.1-pound sensitivity weight to S. Read and record the turning points. Arrest the beam.

(h) Remove the S weight, tare, and sensitivity weight.

(i) Repeat steps a through h using standard (S) and check standard (W2).

(j) Repeat steps a through h using W1 and W2.

(4) Calculations

(a) Use the "3-1 Weighing Sheet" (Attachment 11).

(b) Sum the turning points for the comparisons of S and W1. They will be 0_1, 0_2, 0_3, and 0_4, respectively.

(c) Calculate a1; a1 = S - W1

$$S - W1 = a1 = \frac{(0_1 - 0_2 - 0_3 + 0_4)}{2} \frac{(0.1)}{0_3 - 0_2} + t_S - t_{W1}$$

S = Standard weight
W1 = Test weight
0_1 through 0_4= Sums
t_S = tare with S
t_{W1} = tare with W1

NOTE: If the tare carried with S changed during the observations, use the average tare. If W1 tare changed, average it, also.

(d) Calculate a_2; a_2 = S - W2

(e) Calculate a_3; a_3 = W1 - W2

(f) Use the equations shown on the "3-1 Weighing Sheet" to derive values for:

1) Standard deviation

2) W1 correction

3) W2 correction

(g) Check the value for W1. It should be ± 0.1 pound.

(h) Check the value of W2. Compare it to the last reported value according to control charts maintained under the NIST Laboratory Metrology Program. It must agree within the uncertainty limits of the comparator. If not, examine the comparator and calculations. Retest the weights, if necessary.

(i) Issue a "Report of Calibration" (Attachment 12) showing all W1 values and uncertainties. The sum of these is used as the correction.

h. Railway Track Scale Test Car Calibration

(1) Specifications

(a) Association of American Railroads (AAR) specifications for railway track scale test cars are contained in the 1996 edition of the AAR, Engineering Division, "Scale Handbook". These are general requirements for the construction of the various types of test cars such as, self-contained composite, standard railcar, and self-propelled.

(b) Test cars must be properly cleaned and painted and all repairs completed before arrival at the master scale.

(c) Annual calibration of all railway track scale test cars is required.

(2) Tolerances. AAR, Engineering Division, "Scale Handbook", Section 1.4.1, requires that test cars meet Class F tolerances.

(3) Test Instrumentation - Cars will be calibrated only on approved master railway track scales. Requirements for these scales are found in the AAR Scale Handbook, Section 4.0.

(a) $d \leq 2$ lb

(b) Annual testing under the AAR/FGIS master railway track scale testing program.

(c) Protected from environment

(4) Test Standards - Traceability to NIST - FGIS maintains mass standards of 10,000-pounds each, used in summation for testing master railway track scales and for use with other scales when performing field calibrations.

(5) Procedure

(a) Set up

1) Clean the test car.

2) Check for loose parts, etc.

3) Check any available records.

4) A self-propelled car must have its fuel tank filled prior to calibration.

5) Visually inspect the scale.

6) If using error weights, there should be 20 pounds available, with the smallest weight being 1 pound. They must have a current ROT.

(b) Readings

1) Set up the scale with no load, no drop-weights or counterpoise weights, and the sliding poise set at 50.0 pounds. Balance the scale. This is the zero reference for all future weighings on the scale. Arrest the beam, release, and repeat the reading to show repeatability.

2) Apply the drop-weights or counterpoise weights to the beam in an amount appropriate for the size of the test car to be calibrated (e.g., 100,000 pounds).

3) Position the test car on the center of the scale.

4) Move the sliding poise to attain equilibrium of the beam, and indicate the weight value of the test car. Use a correction for the known error in the scale.

5) Arrest the beam. Release and repeat reading.

6) Adjust the test car by adding or removing stable, metal adjusting material.

7) Remove the test car and recheck zero. Arrest, release, and repeat.

8) Reposition the test car on the center of the scale and move the sliding poise to attain equilibrium of the beam. This reading determines the "as released" error. Arrest, release, and repeat.

9) Remove the test car and recheck zero. Arrest, release, and repeat.

(c) Marking Requirements

1) Stencil the nominal value of the test car the date and location of calibration. Test cars under FGIS jurisdiction shall be stenciled in 1,000-pound increments.

2) The value as released must equal nominal stenciled value +/- Class F tolerance (1 part in 10,000). For a 100,000-pound car, this tolerance is 10 pounds.

(6) Documentation

(a) Records - FGIS maintains the following records that serve to document the traceability of the test car calibration to national standards. The records also document the level of accuracy in the program.

1) Report of Calibration - FGIS Primary Standards

2) Report of Calibration - FGIS Field Standards

3) Measurement Assurance Program Records

4) Master scale test record

5) Test Car calibration work sheet

6) Report of Railway Track Scale Test Car Calibration

(b) Report Format - Each test car calibration is recorded by issuance of a Report of Railway Track Scale Test Car Calibration (Attachment 13)

i. Field Calibration of Test Cars

The FGIS Field Calibration Program is a NIST recognized program, which is accepted by most States. The field calibration service is provided by FGIS to the railroads that do not have access to a Master Scale, or they have a captive car. [A captive car is a test car that cannot be moved out of its location or terminal because of its equipment limitations.] The service involves a procedure for calibrating the cars on location; adjusting the cars, and providing a report of test.

(1) Procedure for Calibration

The track scale used for the calibration must be a mechanical beam scale with a sensitivity of 5 pounds.

(2) Visual Inspection

(a) Inspect the deck for wear and check for binds between the weigh rail and approach rail

(b) Inspect the scale pit for cleanliness and dryness.

(c) Inspect all mechanical connections of the lever system. While conducting this inspection, put the blade edge of a screw driver between the lever and the side of the clevis at the pivot point, and adjust the pivot point so there is equal distance on both sides between the clevis and the lever.

(d) Inspect the weighbeam, poise, butt connection, and counterpoise tip loop connections. Use the same procedure as employed in the inspection of the lever system.

(3) Preliminary Setup

(a) Attach the flexible pointer that is found in the butt-ratio weight kit to the trig loop.

(b) Attach a ruled chart to the weighbeam as close as possible to the tip clevis assembly.

(c) Set up a magnifying glass so that while reading the turning points there will not be a parallax between pointer and the graduated division on the ruled scale.

(4) Test Procedure

(a) The railroad track scale used for field calibration must be tested before test car's calibration.

(b) The section test on the railroad track scale shall be conducted bidirectionally; that is, from one direction, then repeating in the opposite direction.

(c) Normal positions of a test car are designated in order from left to right as: 1R, 2L, 2R, 3L, 3R, 4L, etc. The number representing the section and the letter, when affixed, indicates that the body of the car lies to the left or right of the section with one pair of wheels directly over the section.

(d) Use the test car to be calibrated for the strain test.

(5) Calibration Procedure

(a) Most test cars have a 7 foot wheel base, FGIS weight dollies have a 5 foot wheel bases. Mark a 7 foot area on the deck of the scale using the section with the least amount of error and good repeatability.

(b) Place the weight dolly with the amount of weight equal to the weight of the car on the first mark, add 50 pound test weight to be used as error weights.

(c) Place the poise in the notch for the weight of the dolly, and adjust the balance ball until the beam swings equidistant above and below the center mark of the ruled scale. Read the turning points of the beam. The sum should be near to 20 divisions. If necessary adjust the balance ball until the proper sum is obtained. Record the results.

(d) Arrest the beam and move the weight dolly 2 feet. Release the beam and observe the turning points; add or remove error weights to keep the turning points on the scale. Read the turning points record them and the amount of error weights.

(e) Add a 5 pound sensitivity weight to the weight dolly. Read the turning points and record.

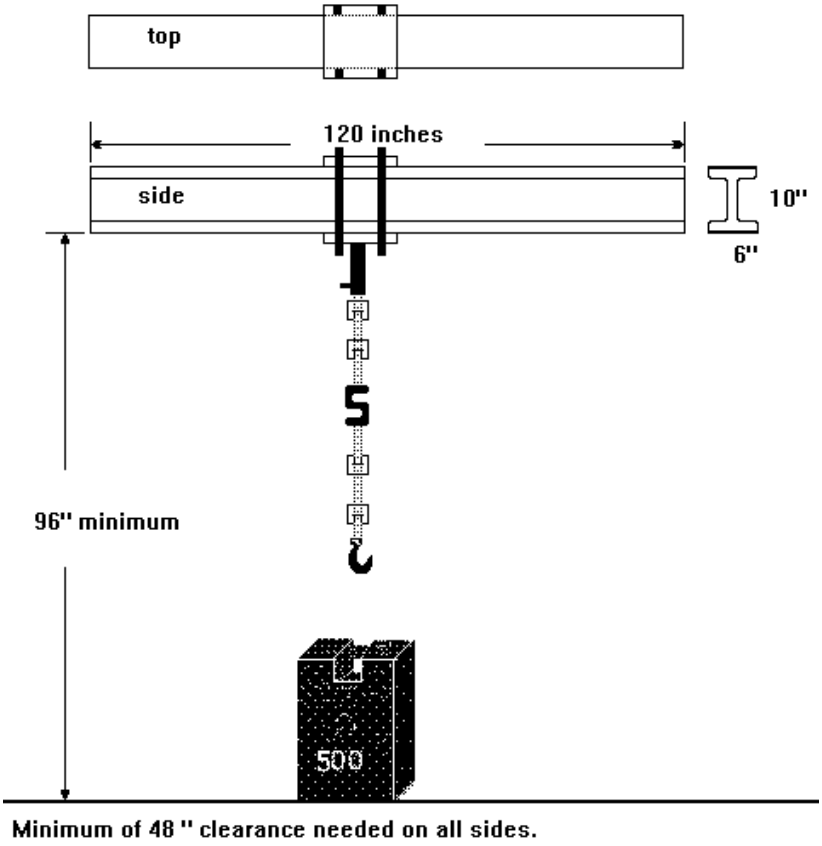
(f) Remove the weight dolly and the 5 pound sensitivity weight and place the test car on the marks. Add or subtract error weights until the turning points are within the sum of 20. Read and record the turning points. Arrest the beam.

(g) Remove the test car from the scale and repeat Step f.

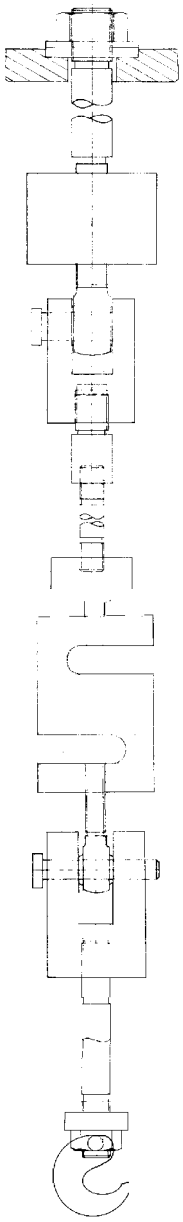
(h) Repeat steps c and d

(i) Complete the data sheet and issue a "Report of Calibration"

TWR Setup


top
120 inches
side
10"
6"
96" minimum
500
Minimum of 48 " clearance needed on all sides.

Electronic Mass Comparator Linkage Assembly



ATTACHMENT 7
WEIGHING HANDBOOK
CHAPTER 3
3.2 WEIGHTS
9/20/96

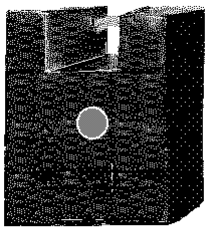
Electronic Mass Comparator Load Cell Program Values

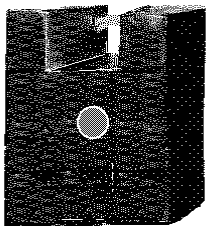
PROG. NO.	CELL	WEIGHT (lb) x D (lb)		
00	--	--	x	--
01	2K	500	x	.01
02	2K	1000	x	.02
03	2K	1500	x	.02
04	2K	2000	x	.02
05	5K	2000	x	.02
06	5K	2500	x	.05
07	5K	3000	x	.05
08	5K	3750	x	.1
09	5K	4000	x	.1
10	5K	5000	x	.1
11	--	--		--
12	--	--		--
13	--	--		--
14	--	--		--
15	--	--		--

Cover and Information Sheet

MANAGER	
COMPANY	
STREET LINE 1	
STREET LINE 2	
CITY, STATE ZIP	

CODE	SIZE	TYPE	MFG	LAST DONE





DESIGN: Show dimensions, location of adjustment cavity, etc.
Mark *CAST*, *FAB* or *OTHER* under the weight to indicate its type.

GIPSA Metrologist_____

Test Weight Reverification Data and Recalibration Report

Test Weight Reverification Data and Recalibration Report

Elevator_____ Sheet _____ of _____

Location_____ Date_____

Temperature_____ Observer_____

$\sum S_{correction}$ _____ Comparator No._____

Description of Load	Observations	Computations	Remarks

TWR Summary Report

TWR Summary Report

Elevator

Location

Dates

GIPSA Weight Code No.	Type of Weight	Nominal Weight Value	Error as found	Error as left N/A=not adjusted	House Weight Code No.	Scale No.

Three and One Weighing Design

3-1 Weighing Sheet

Test No. _____ Sheet No. _____
Temp. _____ Date _____
Balance _____ Observer _____

$S_{correction}$ (K) = _____ S = _____ W1 = _____ W2 = _____

a1 = S - W1 a2 = S - W2 a3 = W1 - W2

Description of Load		Observations		Sums	Initial Computations	Data Development
						+a1 =
						-a2 =
						+a3 =
						Sum =
						* 0.577
						(S) =
					a1 =	standard deviation
						-2a1 =
						-a2 =
						+a3 =
						+3K =
						Sum =
					a2 =	Sum/3 = W1 =
						-a1 =
						-2a2 =
						-a3 =
						+3K =
						Sum
						Sum/3 = W2 =
					a3 =	

Report of Calibration

United States Department of Agriculture
Grain Inspection, Packers and Stockyards Administration
P.O. Box 96454
Washington, D.C.
20090-6454

Test No. 95-2398
April 10, 1995

Report of Calibration

Ten Mass Standards
for Testing Master Railway Track Scales

Identification FGWX 200,000

Submitted by:

United States Department of Agriculture
Federal Grain Inspection Service
Master Scale Depot
Chicago, Illinois

The items identified above have been compared to the primary standards of the Federal Grain Inspection Service. Calibration of these standards is traceable to the National Institute of Standards and Technology.

The identified weights have been found accurate within the Class F tolerance band as specified by NIST Handbook 105-1. These weights are appropriate for testing Master Railway Track Scales for a period of one year from the date of test at which time they should be recalibrated.

Tested by: J. Decker, Industrial Specialist, Washington, D.C.

Results of calibration attached.

Paul Hadyka, Industrial Specialist
Weighing & Equipment Branch

Report of Calibration (continued)

A-Series Weights. FGWX 200,000

DATE	A1	A2	A3	S	W2	W1	ID
16MAR95	0.59200	0.43947	-0.21471	0.03588	0.09825	-0.09573	A1
18MAR95	0.49319	0.50333	-0.09231	0.05911	0.04782	-0.01034	A2
17MAR95	0.47117	0.45789	-0.02222	0.00516	0.06209	0.04285	A3
18MAR95	0.54935	0.42187	-0.08421	0.02497	0.08070	-0.01793	A4
16MAR95	0.45384	0.46471	-0.00952	0.01176	0.05909	0.05636	A5
18MAR95	0.54053	0.49167	-0.21154	0.09386	0.07956	-0.07775	A6
17MAR95	0.46450	0.34333	-0.04231	0.04550	0.14738	0.07879	A7
17MAR95	0.45229	0.43462	-0.02500	0.00422	0.08483	0.06227	A8
17MAR95	0.48887	0.46905	-0.10000	0.04626	0.07468	0.00140	A9
16MAR95	0.57742	0.48421	-0.18158	0.05099	0.06225	-0.08987	CART
						========	
				Total Correction AM vs Brass		- 0.04995 *lb*	

Uncertainty = 3*(0.051) + 0.093 = 0.25 *lb*
each weight

Check Standard Data:

Variable	N	Mean	Std Dev	Minimum	Maximum
S	10	0.0394659	0.0259528	0.0042244	0.0938639
W2	10	0.0833467	0.0281971	0.0478168	0.1473803

NIST ROT 11/88 Std = 10,000.517 *lb*
NIST ROT 11/88 W2 = 10,000.092 *lb*

Long term S from FY95 Lap = 0.051 *lb*

$$\text{Uncertainty W2} = \frac{3*(0.051)}{\sqrt{108}} + 0.093 = 0.108 \text{ lb}$$

W2 UL = 0.200 *lb*
W2 LL = -0.016 *lb*

Report of Test

United States Department of Agriculture | Federal Grain Inspection Service | P.O. Box 96454 Washington, D.C. 20090-6454

November 6, 1995

Report of Test

Scale Test Car
CR 80057

Submitted by: Consolidated Rail Corporation
2001 Market Street, Section 10-B
Philadelphia, Pennsylvania 19101-1401

Date of Test: October 11, 1995

The railway track scale test car was calibrated on the Federal Grain Inspection Service master scale in Chicago, Illinois.

Test Car Number	Nominal Weight (pounds)	Error as Received (pounds)	Error as Released (pounds)
CR 80057	100,000	-12.0	3.0

Remarks: The test car is in good condition.
Test conducted by Fred Anderson.

Richard R. Pforr, Chief
Weighing and Equipment Branch
Field Management Division

cc: Louis T. Cerny, AAR
Fred Anderson

(Blank Page)